glass face whereby a half wave-length is lost at the mirror but not at the glass face in contact, the fringes are impaired, making a rather interesting experiment. With homogeneous light the fringes of the film itself appear to the naked eye, as they are usually very large by comparison.

Granting that the fringes in question depend upon the reflecting surface behind the grating, they must move if the distance between them is varied. Consequently a phenomenon so easily produced and controlled is of much greater interest in relation to micrometric measurements than at first appears and we have for this reason given it detailed treatment. It has the great advantage of not needing monochromatic light, of being applicable for any wave-length whatever and of admitting of the measurement of small horizontal angles.

When the phenomenon as a whole is carefully studied it is found to be multiple in character. In each order of spectrum there are different groups of fringes of different angular sizes and usually in very different focal planes. Some of these are associated with parallel light, others with divergent or convergent light, so that a telescope is essential to bring out the successive groups in their entirety. At any deviation the diffracted light is necessarily monochromatic; but the fringes need not and rarely do appear in focus with the solar spectrum. If the slit of the spectroscope is purposely slightly inclined to the lines of the grating, certain of the fringes may appear inclined in one way and others in the opposite way, producing a cross pattern like a pantograph. The reason for this appears in the equations.

In any case the final evidence is given when the reflecting face behind the grating is movable parallel to it. The principal fringes of the interferometer so obtained are subject to the equation (air space e, wave-length λ, angle of incidence i, of diffraction θ'),

$$\delta e = \lambda/2(\cos\theta' - \cos i),$$

and it is therefore less unique as an absolute instrument than Michelson's classic apparatus or the device of Fabry and Perot. Its sensitiveness per fringe depends essentially upon the angle of incidence and diffraction and it admits of but 1 cm. (about) of air space between grating face and mirror before the fringes become too fine to be available. But on the other hand, it does not require monochromatic light (a Welsbach burner suffices), it does not require optical plate glass, it is sufficient to use but a square centimeter of grating film, and it admits of very easy manipulation, for painstaking adjustments as to normality, etc., are superfluous. In fact, all that is needed is to put the sodium lines in the spectrum reflected from the grating and from the mirror into coincidence both horizontally and vertically with the usual three adjustment screws on grating and mirror. Naturally sunlight is here desirable. Thereupon the fringes will usually appear and may be sharply adjusted on a second trial at once.

When the air space is small, coarse and fine fringes (fluted fringes) are simultaneously in focus, one of which may be used as a coarse adjustment on the other. Finally the sensitiveness per fringe to be obtained is easily a length of one half wave-length in the fine fringes and one wave-length in the coarse fringes, though the latter may also be increased almost to the limit of the former.

C. Barus,
M. Barus

Brown University,
Providence, R. I.

THE EFFECT OF ASPHYXIA ON THE PUPIL[1]

In a recent communication to the Society for Experimental Biology and Medicine (p. 49, December 16, 1908) Dr. John Auer stated that the "Myotic effect of asphyxia in frogs is interesting, as asphyxia in mammals produces chiefly dilatation." We were surprised at this statement, as we had a different impression from having observed the pupils of various animals during asphyxia. As such observations are usually recorded we examined our protocols, and finding our impression con-

[1] From the physiological laboratories of Washington and Pittsburgh universities.

firmed, we have made a few additional observations in order to completely satisfy ourselves in the matter. Having gathered the data, we feel that it should be reported, since we find but slight mention of the phenomena in current physiological treatises we have had the opportunity to examine.[2] We have exhausted the available original sources at our command and very little has been found. We have the impression that very thorough observations have long since been made and recorded, but in view of the above conditions we feel justified in recording briefly our observations in order to recall attention to the phenomena. We may add that we hope to more thoroughly exhaust the literature as opportunity affords, and if it then seems desirable, to publish our results in greater detail.

Our data show that in all animals observed, only momentary or no dilatation of the pupils occurs during the first stage of rapid asphyxia (*e. g.*, by bleeding or by clamping the trachea or by insufflating the lungs with carbon dioxide or hydrogen gas), and that as a rule a *very marked constriction* of the pupils occurs during this stage. We have observations on sheep, rabbit, guinea pig, squirrel, rat, mouse, dog, cat, chicken, guinea fowl, pigeon, dove, sparrow and snake. As yet our data are incomplete on the effect of section of the nerves governing the pupil on the asphyxial changes.

It is interesting to note the post mortem differences observed in the size of the pupils in different animals, *e. g.*, cats show wide dilatation, while common gray rabbits, as a rule, show marked constriction. It is known that the eye (excised) of a frog or eel constricts its pupil on exposure to light, and dilates it in the dark; and that even the isolated iris of the eel contracts in the light.[3]

[2] For example, Starling, "Text-book of Physiology," p. 404, 1907, merely mentions constriction of the pupils in early stages of asphyxia; Paton, "Essentials of Human Physiology," 1905, p. 306, states that in the initial stage of acute asphyxia the pupils are small, while a number of writers do not mention it at all.

[3] Stewart, "Manual of Physiology," fifth edition, p. 798.

Photic stimulation, the "at rest" condition of the pupil, etc., obviously should be taken into consideration in drawing conclusions on the size of the pupil in the eyes of dead animals or in excised eyes.

C. C. GUTHRIE,
F. V. GUTHRIE,
A. H. RYAN

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE SECTION D

PROFITING by the experience of former meetings and in accordance with the actions of the council and section at the Baltimore meeting, the chairman and secretary of Section D, in arranging the program for the Boston meeting, had in mind, in addition to the accommodation of papers volunteered by the members at large, a program, to be covered in a small number of sessions and in the compass of two days, which should provide: (*a*) a "general interest" session, including the address of the retiring vice-president; (*b*) a series of solicited papers on aeronautics and related subjects; (*c*) a joint session with Sections A and B.

As a result of the plans thus formulated, the section held a session on Tuesday morning, December 28, at which in addition to the business of the organization and election of officers, papers on miscellaneous subjects were presented; a session on Wednesday morning, devoted to papers on aeronautics, and the general interest session on Wednesday afternoon. On Tuesday afternoon the members of the section attended a joint session of Sections A and B.

Professor A. Lawrence Rotch was elected chairman of the section and a vice-president of the association for 1910; Professor W. J. Humphreys, member of the sectional committee for five years; President F. W. McNair, member of the council for 1910, and Mr. A. M. Herring, member of the general committee for the Boston meeting.

Vice-president J. F. Hayford presided at all meetings of the section. The program in detail is given herewith:

TUESDAY A.M., DECEMBER 28

"Some Notes on the Cutting of Music Rolls and on a New Machine for Making Master or Pattern Rolls," J. F. Kelly, Pittsfield, Mass. (Presented by Walter Reed.)